

## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the medical capsule which inserts into the abdominal cavity and performs medical science treatment, such as diagnostic treatment of the part in the abdominal cavity.

[0002]

[Description of the Prior Art] In order to know the living body situation in the abdominal cavity, what is performed by introducing a medical capsule to the inside of the body as a method which measures it, and has treated enough directly and carries out a part in the living body is proposed. Conventionally, the thing provided with the wire rope which leads to the thing and the outside of the body of the non-funiculus type with which a medical capsule is inserted independently as this kind of a medical capsule owner funiculus type is considered.

[0003] However, since the cell was used also although the cell was built in at least, and a fixing means, an observing means in the living body, etc. to a body wall are driven if it was in the non-funiculus type medical capsule, consumption of a cell was large and may be unable to perform sufficient measurement or therapy. If a cell is enlarged in order to enlarge capacity of a cell, the capsule body itself will become large and the advantage as the part and a medical capsule will be spoiled.

[0004] On the other hand, if it is in the medical capsule of the owner funiculus type which supplies energy through a cable from the outside of the body, Although there was no fault of a non-funiculus type which was mentioned above, since the capsule in the living body and the external energy source were tied in the midst of measurement or treatment by the cable which passes along the portion of a throat, for example, the patient's pain was large.

[0005]

[Problem(s) to be Solved by the Invention] As mentioned above, each of non-funiculus type medical capsules and owner funiculus type medical capsules has merits and demerits, and an improvement of this was desired. This invention was made paying attention to said technical problem, and there is a place made into the purpose in providing the medical capsule which can reduce a patient's pain, while large-sized-ization of a capsule body can avoid as much as possible and a possibility that the measurement or the therapy accompanying consumption of a cell cannot fully be performed is avoidable.

[0006]

[Means for Solving the Problem and its Function] In a medical capsule which this invention inserts a capsule into the abdominal cavity, and performs medical science treatment, such as diagnosis and a therapy, It has a fixing means to a body cavity wall, and a means to connect an in-the-living-body detention unit with a function to perform said medical science treatment, a body unit of an owner funiculus with a means which carries out driving operation of said fixing means, and said in-the-living-body detention unit and said body unit enabling free attachment and detachment is provided. Therefore, a patient's pain is mitigable, while large-sized-ization of a capsule body can avoid as much as possible and a possibility that measurement or a therapy accompanying consumption

of a cell cannot fully be performed is avoidable, since it can be used being able to detain only use and a detention unit in the state where it united according to the operating condition in the inside of the body. That is, a fault of a non-funiculus type medical capsule and an owner funiculus type medical capsule can be canceled, and the strong point of each type can be employed efficiently.

[0007]

[Example] Drawing 1 thru/or drawing 3 show the medical capsule concerning the 1st example of this invention. This medical capsule consists of the detention unit 1 for detaining in the inside of the body continuously, and the body unit 2 which makes this detention unit 1 unite enabling free attachment and detachment, and is derived to the inside of the body in the state where the detention unit 1 was made to unite to the body unit 2.

[0008] Although the body unit 2 joins said detention unit 1 to that front end surface and is made to unite to it, attachment and detachment of the detention unit 1 and the interface part 3 for transmission of a signal or energy are constituted by each connection end which this detention unit 1 and body unit 2 join. The cable 4 is connected with the back end of the body unit 2. A power source line, various kinds of control signal lines besides the light guide means of the illumination light and the transmission means of an imaging signal, etc. which are mentioned later are collectively included in the cable 4.

[0009] The illumination method 5 and the imaging means 6 are formed in the front top of the body unit 2. And from the illumination method 5, the derived inside of the body is illuminated and the inside of the body is picturized by the imaging means 6. The body unit 2 projects the leg object 7 from that lower part to front and rear, right and left, and constitutes the transportation device 8 which walks a body cavity wall side top with two or more of these leg objects 7.

[0010] The sensor part 10 is formed at the tip of the detention unit 1, and the antenna section 11 is formed in the upper surface. Two or more sandwiching pieces 12 are projected in the lower part of the detention unit 1, it is provided in it, a body cavity wall is put between it with two or more of these sandwiching pieces 12, and a means to fix that detention unit 1 to a body cavity wall is constituted.

[0011] As drawing 3 shows, in the joined part of the detention unit 1 and the body unit 2, the 1st permanent magnet 13 is formed in the detention unit 1 side, and one pole of the 1st permanent magnet 13 is arranged towards the body unit 2 side. This 1st permanent magnet 13 is countered and the 1st electromagnet 14 is formed in the body unit 2 by the direction which makes the magnetic pole of one of these counter said 1st permanent magnet 13. If current is sent and magnetized on the 1st electromagnet 14 so that the polarity of the magnetic pole of said 1st permanent magnet 13 and the magnetic pole of the 1st electromagnet 14 that faces this may differ, it will attract the 1st permanent magnet 13 and 1st electromagnet 14 of each other's, and the detention unit 1 and the body unit 2 will be combined.

[0012] For example, current is sent through the direction which serves as the south pole in the polarity of the magnetic pole of the 1st electromagnet 14 that faces the permanent magnet 13 in the polarity of the 1st permanent magnet 13 shown by drawing 3. If direction of the current sent through the 1st electromagnet 14 is made reverse, the polarity of the magnetic pole of the 1st electromagnet 14 becomes reverse, the 1st permanent magnet 13 and 1st electromagnet 14 will oppose, union with the detention unit

1 and the body unit 2 will be canceled, and the detention unit 1 will dissociate from the body unit 2.

[0013]The sandwiching piece 12 of a means to fix the detention unit 1 to a body cavity wall forms the claw part 15 in the direction which faces the protrusion tip mutually.

The sandwiching piece 12 most located in the body unit 2 side can be freely rotated toward other sandwiching pieces 12, and the other sandwiching pieces 12 are formed fixed.

The sandwiching piece 12 which can rotate freely is connected with the end of the rotating arm 16 provided in the case body of the detention unit 1. The 2nd permanent magnet 17 is attached to the other end of the arm 16. The 2nd permanent magnet 17 is countered and the magnetic member 18 which consists of iron pieces etc. is attached to the rear end face part of the detention unit 1. One pole tip of the 2nd permanent magnet 17 can run against that magnetic member 18, and the sandwiching piece 12 puts a body cavity wall portion with other sandwiching pieces 12 by rotation of the rotating arm 16 at this time.

[0014]This magnetic member 18 is countered, the 2nd electromagnet 19 is formed in the body unit 2, and it is arranged by the direction which makes one magnetic pole of that electromagnet 19 counter said magnetic member 18. If current is sent and magnetized on the 2nd electromagnet 19 so that the 2nd permanent magnet 17 may oppose with the 2nd electromagnet 19 after the detention unit 1 and the body unit 2 have united, the 2nd permanent magnet 17 will separate from the magnetic member 18, and it will rotate so that the rotating arm 16 may open. That is, since it rotates in the position shown as a solid line in (b) of drawing 3, the rotating sandwiching piece 12 separates from other sandwiching pieces 12, and does not put a body cavity wall portion. That is, the detention unit 1 is not fixed to a body cavity wall portion. On the other hand, since the 2nd permanent magnet 17 will approach the magnetic member 18 and will adsorb if the energization to the 2nd electromagnet 19 is stopped, since it rotates in the position shown by a dotted line in (b) of drawing 3, the rotating sandwiching piece 12 approaches other sandwiching pieces 12, and the rotating arm 16 puts a body cavity wall portion. That is, the detention unit 1 is fixable to a body cavity wall portion.

[0015]As drawing 3 shows, the cell 21 and the telemeter part 22 are built in the detention unit 1. The cell 21 supplies electric power to each part of the detention unit 1. The telemeter part 22 serves to transmit the body data measured by the sensor part 10 mentioned above from the antenna section 11 to the outside of the body. When the signal line 23 which leads to the telemeter part 22 is formed and this detention unit 1 has united to the body unit 2, the signal line 23 leads to the body unit 2 and the cable 4 through said interface part 3. And the signal line 23 is used to receive the operation start signal of the telemeter part 22 before the detention unit 1 is separated from the body unit 2.

[0016]This signal line 23 is used also for the following usage. That is, when measuring two or more places of the inside of the body one by one and going between short time, Both the units 1 and 2 that united are derived to the part of the request in the abdominal cavity, without separating the detention unit 1 from the body unit 2, It is a case where the body data measured by each part is further transmitted to the exterior through the body unit 2 and the cable 4 through the interface part 3 from the signal line 23.

[0017]As drawing 3 shows to the body unit 2, the light guide fiber 25 as the illumination method 5 and the image guide fiber 26 as the imaging means 6 are formed. This light

guide fiber 25 and image guide fiber 26 are led to the exterior through the cable 4. And the light guide fiber 25 is connected to an illumination light source device, and the image guide fiber 26 is connected to a viewing device.

[0018]When carrying out a deer and using this medical capsule, after the detention unit 1 and the body unit 2 have united, it derives in the abdominal cavity. Although various measurement data can be obtained also in this state where it united, using the sensor part 10, When you need prolonged detention, the detention unit 1 is derived to the predetermined part in the abdominal cavity, and by stopping the energization to the 2nd electromagnet 19, two or more sandwiching pieces 12 of a fixing means are operated, this pinches an abdominal cavity wall portion, and it fixes the detention unit 1. Then, the detention unit 1 and the body unit 2 are separated. The body unit 2 is taken out outside of the body, and detains only the detention unit 1 in the inside of the body. And using the sensor part 10, measurement data, such as a temperature in the living body and the pH of body fluid, is obtained, and the measurement data is transmitted to the outside of the body from the antenna section 11.

[0019]When collecting the detention units 1, the body unit 2 is derived and brought close to a place with the detention unit 1 in the abdominal cavity again, and the detention unit 1 and body unit 2 are made to unite. And by energizing to the 2nd electromagnet 19, the sandwiching piece 12 of said fixing means is opened, and the fixed state which pinches an abdominal cavity wall portion is canceled. And the detention unit 1 and the body unit 2 which united are taken out to the outside of the body after this.

[0020]Drawing 4 starts the 2nd example of this invention, especially shows the modification of the detention unit 1. The hollow needle 32 which protrudes outside from the outside surface of that main part of a unit by the needle driving actuator 31 is formed in this detention unit 1, and the chemical tank 33 is connected to the hollow needle 32. Chemical-feeding AKUCHICHUETA 34 is formed and the drug solution of the chemical tank 33 is sent out to the hollow needle 32 by this. The body unit 2, its interface part 3, etc. are the same as that of what was mentioned above.

[0021]When carrying out a deer and using this medical capsule, If a drug solution administration command signal is received through the signal line 23 after deriving in the abdominal cavity after the detention unit 1 and the body unit 2 have united, and fixing to the part in the abdominal cavity, the needle driving actuator 31 will extrude the hollow needle 32 out of the detention unit 1. The hollow needle 32 is pierced in a body wall by this. Subsequently, the chemical-feeding actuator 34 operates and the drug solution of the chemical tank 33 is gradually poured in into a living body through the hollow needle 32. Even after separating the body unit 2, a drug solution is poured little by little into a living body over many hours.

[0022]On the other hand, after uniting the body unit 2 to that detention unit 1 at the time of recovery, the needle driving actuator 31 is operated with a command signal, and these capsules are collected as a state which drew the hollow needle 32.

[0023]Since the cell 21 is used only for the attitude of the hollow needle 32, and extrusion of a drug solution and it is not used for movement of the body unit 2 or immobilization of the detention unit 1, there is little consumption of the cell 21.

[0024]Drawing 5 shows the 3rd example of this invention. LED41 as an illumination method, CCD42 as an imaging means, the screw-thread driving actuator 43 mentioned later, and the gear drive motor 44 are formed in the body unit 2, and the control section

45 which controls them and the transportation device 8, and the power supply 46 which supplies electric power to them are further formed in it.

[0025]The screw-thread ring 47 is inserted in the anterior part periphery of the body unit 2, enabling free rotation. This screw-thread ring 47 is suitably rotated by the screw-thread driving actuator 43 mentioned above. This screw-thread ring 47 is screwed in the thread part 48 formed in the rear end part periphery of the detention unit 1, and connects the detention unit 1 and the body unit 2. That is, it \*\*\*'s by the screw-thread driving actuator 43, the ring 47 is rotated, and the detention unit 1 is detached and attached.

[0026]Corresponding to the connecting part, the gears 49 and 50 are formed in the detention unit 1 and the body unit 2. When the detention unit 1 and the body unit 2 connect, these gears 49 and 50 can be connected mutually and rotation of the gear 49 by the side of the body unit 2 can transmit them to the gear 50 by the side of the detention unit 1. The gear 49 by the side of the body unit 2 is rotated with the gear drive motor 44 mentioned above. The gear 50 by the side of the detention unit 1 operates the sandwiching piece 12 by the side of rotation of a fixing means, pinches an abdominal cavity wall portion by this, and fixes the detention unit 1. That is, a fixing means is driven.

[0027]The memory 51 which memorizes the data measured by the sensor part 10 is formed in the detention unit 1 in this example. The data memorized in this memory 51 is read after collecting outside of the body. Since there is no telemeter, there is little consumption of the cell 21. Since there are few signal wires along which it passes on the cable 4 of the body unit 2, the cable part can be made thin.

[0028]Drawing 6 shows the 3rd example of this invention. Fixing means [ in / in this example / the detention unit 1 ] differ, and other composition is the same as that of what was mentioned above. That is, the fixing means in this detention unit 1 becomes depressed into the undersurface portion of that unit case, forms 55, and has formed the suction path 56 in the pars basilaris ossis occipitalis of this hollow 55. This suction path 56 is open for free passage to the suction path 57 formed in that body unit 2, when that detention unit 1 and body unit 2 are connected. The valve 58 is formed in the middle of the suction path 56 in the detention unit 1, and the suction path 56 is opened and closed. The valve 58 is operated by the valve driving actuator 59 provided in the detention unit 1. The valve driving actuator 59 is connected to the signal line 60. The signal line 60 is connected to the signal line 61 by the side of the body unit 2 when it unites.

[0029]If make it unite, derive the detention unit 1 and the body unit 2 to the inside of the body, the valve driving actuator 59 is driven through the signal lines 60 and 61 by a position, the valve 58 is opened and it draws in through the suction paths 56 and 57, Since the portion of the hollow 55 becomes negative pressure, a living body wall can be adsorbed in this hollow 55. The valve 58 is closed in this state. Then, an adsorbed state is maintainable, and even if it separates the body unit 2, the detention unit 1 is fixable. If the body unit 2 is made to unite to the detention unit 1 at the time of recovery and the valve 58 is opened, the fixed state can be canceled.

[0030]This invention may connect the same kind of two or more detention units by one set of a body unit, and chooses the detention unit of a function which is different if an interface part is common, and it is usable in it.

[0031]

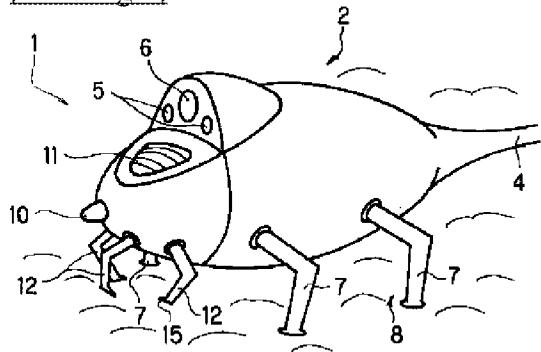
[Effect of the Invention]A patient's pain is mitigable, while according to the composition

of the medical capsule of this invention large-sized-ization of a capsule body can avoid as much as possible and a sufficient possibility that it cannot carry out is [ the measurement or the therapy accompanying consumption of a cell ] avoidable, as explained above. The fault of a non-funiculus type medical capsule and an owner funiculus type medical capsule can be canceled, and the strong point of each type can be employed efficiently.

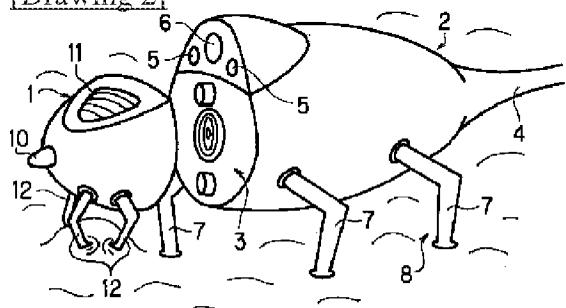
## DRAWINGS

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[Drawing 1]



[Drawing 2]



[Drawing 3]

